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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

VINH, LAN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 01/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/624,712	Applicant(s) BENTUM ET AL.	
	Examiner Lan Vinh	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 October 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 and 25-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 25-34 is/are allowed.
- 6) ☒ Claim(s) 1,2,6-12 and 15-17 is/are rejected.
- 7) ☒ Claim(s) 3-5,13 and 14 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 6-10 are rejected under 35 U.S.C. 102(e) as being anticipated by Tang et al (US 6,479,377)

Tang discloses a method for making a semiconductor device. The method comprises the steps:

forming an narrow/isolation trench 32 and a wide/contact trench 36 in a substrate, wherein a width of said isolation trench is less than a width of said contact trench (fig. 7A)

depositing an insulating material 40 over the narrow/ isolation trench and said contact trench to substantially fill said isolation trench and reduce an effective width of said contact trench (col 5, lines 45-47; fig. 8)

removing at least partially said insulating material from a bottom of said contact trench (col 6, lines 35-38; fig. 9)

filling in a conductive material into said contact trench to form a contact (col 7, lines 4-6; fig. 10)

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Regarding claim 6, Tang discloses that the contact trench having a width (fig. 7A)

Regarding claim 7, Tang discloses the step of dry etching/anisotropically etching the insulating layer 40 (col 6, lines 26-28)

Regarding claim 8, Tang discloses the step of forming a etch stop layer 18 and depositing a dielectric layer 28 on layer 18 (col 5, lines 35-38)

Regarding claims 9-10, Tang discloses the step of filling the contact trench with conductive material such as tungsten and removing excess material by CMP (col 7, lines 5-10)

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made

4. Claims 2, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tang et al (US 6,479,377) in view of Choi et al (US 5,629,238)

Tang method has been described above. Unlike the instant claimed inventions as per claims 2, 15, Tang fails to disclose forming a buried conductive region in the substrate below said contact trench such that said buried region at least partially overlaps with said contact trench, said buried conductive region being conductively coupled to said contact

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Choi discloses a method for forming conductive line comprises the step of forming a buried conductive region 26 in the substrate below the contact trench such that said buried region at least partially overlaps with the contact trench, said buried conductive region being conductively coupled to said contact (col 5, lines 51-53)

One skilled in the art at the time the invention was made would have found it obvious to modify Tang by adding the step of forming a buried conductive region in the substrate below the contact trench to form a conductive line as taught by Choi (col 5, lines 50-55)

5. Claims 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tang et al (US 6,479,377) in view of Lou et al (US 5,872,045)

Tang method has been described above. Unlike the instant claimed inventions as per claims 11-12, Tang fails to disclose using doped polysilicon as conductive material and forming a barrier layer on inner sidewalls of the contact trench

Lou discloses a method for fabricating STI comprises the steps of using doped polysilicon as conductive material and forming a barrier layer on inner sidewalls of the contact trench (col 5, lines 5-14)

Hence, one skilled in the art at the time the invention was made would have found it obvious to modify Tang method by using doped polysilicon as conductive material and forming a barrier layer on inner sidewalls of the contact trench as per Lou because Lou discloses that the doped polysilicon improves the removal rate uniformity across the substrate (see abstract) and the layer on inner sidewall of the trench serve as an oxidation barrier layer (col 5, lines 6-7)

6. Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tang et al (US 6,479,377) in view of Choi et al (US 5,629,238) and further in view of Brown et al (US 6,498,372)

Tang as modified by Choi has been described above. Unlike the instant claimed inventions as per claims 16-17, Tang and Choi fail to disclose the step of implanting the substrate below the contact trench through the insulating layer to form the buried region after removing the insulating layer at the bottom of the contact trench

Brown discloses a method for forming electrical structure in semiconductor device comprises the step of implanting the substrate below the contact trench through the insulating layer to form the buried region after removing the insulating layer at the bottom of the contact trench (col 4, lines 15-20; fig. 3)

Hence, one skilled in the art at the time the invention was made would have found it obvious to modify Tang and Choi method by implanting the substrate below the contact trench through the insulating layer to form the buried region as per Brown because Brown discloses that it is known on the art to implant dopants through the trench into the substrate to form the doped buried region (col 4, lines 9-16)

Allowable Subject Matter

7. Claims 25-34 allowed.

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Claims 3-5, 13-14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for allowance/reasons for the indication of allowable subject matter: Regarding claims 3, 25, 29, 32, the cited prior art of record, taken alone or in combination, fails to disclose a method comprises the step of forming the buried conductive region prior to the formation of the isolation trench and contact trench, in combination with the rest of the limitation of claims 3, 25, 29, 32. The closest cited prior art of Choi et al (US 5,629,238) discloses forming buried region 26 below contact trench after the formation of the isolation trench and contact trench (fig. 7B)

Response to Arguments

8. Applicant's arguments filed 10/24/2005 have been fully considered but they are not persuasive.

Applicants argue that independent claim 1 recites the steps of forming an isolation trench and a contact trench in a substrate, wherein a width of the isolation trench is less than a width of the contact trench, and depositing an insulating material over the isolation trench and the contact trench to substantially fill the isolation trench and reduce an effective width of the contact trench. At no point does Tang disclose or even suggest a methodology that includes at least these limitations because in Tang neither the trench 32 nor the trench 36 are formed in the substrate 12 since they are formed above the substrate 12. This argument is unpersuasive because while it is true that in Tang,

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trench 32 and 36 are formed above the substrate 12, it is also true that the office action did not refer to substrate 12 as the substrate (see paragraph 2 above), the office action referred to underlying layer 28 as the claimed substrate. It is noted that the term substrate can be defined in Dictionary.com website as:

1. The material or substance on which an enzyme acts.
2. Biology. A surface on which an organism grows or is attached.
3. An underlying layer; a substratum.
4. Linguistics. An indigenous language that contributes features to the language of an invading people who impose their language on the indigenous population

Since fig. 7A of Tang shows that trench 32 and 36 are formed in the layer 28/substrate, the examiner asserts that Tang discloses the step of forming an isolation trench and a contact trench in a substrate

The applicants further argue that the structure 32 in Tang is not an isolation trench as that term is used in the specification and claims because Tang specifically refers to structure 32 as a local interconnect trench, the trench is temporarily filled with a dielectric layer 40 as part of the processing therein. This argument is unpersuasive because while it is true that Tang specifically refers to structure 32 as a local interconnect trench, the trench is temporarily filled with a dielectric layer 40, it is also true that claim 1 recites "wherein a width of said isolation trench is less than a width of said contact trench, depositing an insulating material over said isolation trench and contact trench to substantially fill said isolation trench". Since Tang discloses forming a narrow/isolation trench 32 and a wide/contact trench 36 in a substrate, wherein a width of trench 32/isolation trench is less than a width of the trench 36/contact trench (fig. 7A)

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and depositing an insulating material 40 over the narrow/ isolation trench and said contact trench to substantially fill the trench 32/ isolation trench, it is asserted that the structure 32, in Tang, meets the requirement for the claimed isolation trench, as recited in claim 1.

In response to applicant's argument that there is no suggestion to combine the references of Tang and Choi because Choi does not disclose any trenches in the substrate 10. The examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, since Choi is relied only for the teaching of "forming a buried conductive region 26 in the substrate below the contact trench such that said buried region at least partially overlaps with the contact trench, said buried conductive region being conductively coupled to said contact (col 5, lines 51-53) and the motivation to combine comes from Choi. One skilled in the art at the time the invention was made would have found it obvious to incorporating Choi teaching in Tang method to produce the claimed invention.

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 571 272 1471. The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to be 'V. Lee' or similar, written in a cursive style.

LV

January 4, 2006